

Notice of Allowability

Application No.

10/823,619

Examiner

Brent S. Stace

Applicant(s)

AMANO ET AL.

Art Unit

2161

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to an amendment filed 8/14/2006.
2. ☒ The allowed claim(s) is/are 12,13,15,16,18,24,25,27,28,30-34 and 36.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413),
Paper No./Mail Date 10/4/06.
7. ☒ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

DETAILED ACTION

1. Claims 12-18 and 24-36 are pending in this Office action.

EXAMINER'S AMENDMENT

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to the applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview and several facsimile transmissions with Colin D. Barnitz Esq., Reg. No. 35,061 from 9/25/2006 through 10/4/06.

3. **In the specification:**

Please replace page 8, the first full paragraph starting at line 5 and continuing to line 15 with the following amended paragraph

The storage system 100 provides a snapshot (SS) 107 of the data volumes comprising a journal group. For example, the snapshot 107 is representative of the data volumes 101 in the journal group 106 at the point in time that the snapshot was taken.

Conventional methods are known for producing the snapshot image. One or more snapshot volumes (SVOL) 105 are provided in the storage system which contains the snapshot data. A snapshot can be contained in one or more snapshot volumes.

Though the disclosed embodiment illustrates separate storage components for the

journal data and the snapshot data, it can be appreciated that other implementations can provide a single storage component for storing the journal data and the snapshot data.

Please replace page 8, the second full paragraph starting at line 16 and continuing to line 22 with the following amended paragraph.

A management table (MT) 108 is provided to store the information relating to the journal group 102, the snapshot 107, and the journal volume(s) 106. A complete discussion of the details of the management table 108 and its use is provided in the related application Ser. Nos. 10/608,391, 10/621,791 and 10/627,507 identified above and as such the contents of each including the details of the management table 108 and its use are incorporated herein by reference.

Please replace page 19, the third full paragraph starting at line 14 and continuing to line 24 with the following amended paragraph.

A per the flowchart of the present invention as illustrated in FIG. 11, this method requires a trigger to stop taking journal entries 305. Thus, as per the flowchart of FIG. 11 at, for example, initialization a user defines the threshold of free capacity 803 and/or the threshold rate of free capacity 804 in the MTFCJ 120 (Step 1101). The controller 140 takes a snapshot (Step 1106). An application sends a write request to write data in the DVOL 101 (Step 1102). The controller 140 checks the capacity of the journal pool (Step 1103). If the capacity of journal pool is less than the threshold 803, then the

Art Unit: 2161

controller 140 stops taking journal entries (Step 1104). If the capacity of journal pool is greater than or equal to the threshold 803 (804), then the controller 140 takes journal entry (Step 1105). If desired a user can stop taking journal entries manually.

4. In the drawings:

Please replace Fig. 1 with the following Figure.

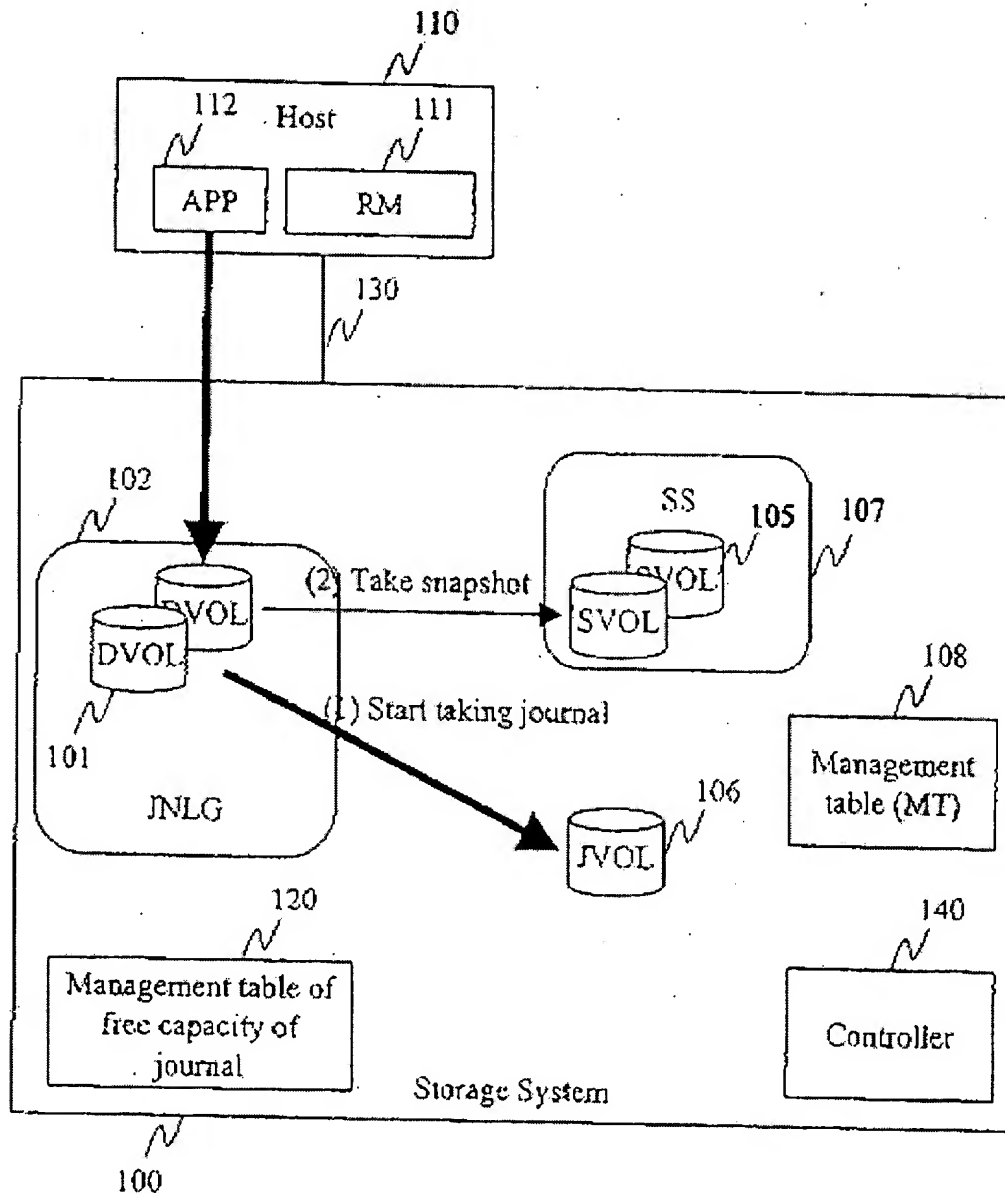


Fig. 1 : Overview of backup

5. In the Claims:

Art Unit: 2161

Please ~~amend~~ Claims 12, 18, 24, 25, 30, 31, 36 with amended Claims 12, 18, 24, 25, 30, 31, 36 and cancel Claims 14, 17, 26, 29, and 35.

12. (Currently Amended) A backup and recovery method for a storage system that avoids journal overflow, the method comprising:

producing at least a first snapshot of a data volume, said data volume being configured to receive data by way of write operations issued from a host device;

producing a journal entry for each write operation issued from the host device;

storing each journal entry in a journal volume, thereby accumulating a list of journal entries;

monitoring an amount of free space on the journal volume upon receiving a write operation;

stopping the storing of journal entries when the free space falls below a threshold value, thereby avoiding journal overflow, wherein said threshold value includes a first indication of a lowest amount of the free space of capacity of the journal volume; and

switching to bitmap management by using a bitmap representation of storage areas in the data volume to track the storage areas in the data volume to which the write operations are directed until additional capacity is provided for the journal volume; and

storing a new journal entry in the journal volume following adding of capacity by taking a logical snapshot, wherein taking a logical snapshot includes deleting any stored journal entries corresponding in the bitmap to the new journal entry.

18. (Currently Amended) A backup and recovery method according to claim ~~47~~ 16, wherein said threshold value includes ~~is an a second~~ indication of the a lowest percentage measure of the an amount of free space to the a total amount of capacity of the journal pool that the storage system is allowed to ~~reach~~ fall below.

24. (Currently Amended) A backup and recovery method for a storage system that avoids journal overflow, the method comprising:

- providing a journal pool for storage of journal entries, said journal pool having a storage capacity;
- producing a first snapshot of a data volume, said data volume being configured to receive data by way of write operations issued from a host device, said snapshot being a copy of data of said data volume at a point in time;
- monitoring an amount of free space in the journal pool upon receiving a write operation;
- storing a journal entry in the journal pool for each write operation directed to said data volume if the free space in the journal pool is not less than a threshold value, wherein the threshold value is an indication of a lowest amount of free space of capacity of the journal pool to allow the storage system to fall below;

Art Unit: 2161

- stopping the storing of journal entries in the journal pool when the free space in the journal pool falls below the threshold value, thereby avoiding overflow of the journal pool;
- switching to bitmap management upon the stopping of the storing of the journal entries, wherein changes to the data stored on the data volume are represented by a bitmap, and a condition of each bit of the bitmap indicates whether a change has been made to a corresponding storage area of the data volume; and
- storing a new journal entry in the journal pool following adding of capacity by taking a logical snapshot that includes deleting any stored journal entries corresponding in the bitmap to the new journal entry.

25. (Currently Amended) A backup and recovery method according to claim 24, further including adding capacity to said journal pool following the stopping of the storing storage of journal entries by allocating additional storage media to said journal pool.

30. (Currently Amended) A backup and recovery method according to claim-29 28, wherein said threshold value is an indication of ~~the~~ a lowest percentage measure of the amount of free space to ~~the~~ a total amount of capacity of the journal pool that is allowable.

31. (Currently Amended) A backup and recovery method for a storage system that avoids journal

overflow in said storage system, the method comprising:

- providing a journal pool for storage of journal entries, said journal pool having a storage capacity;
- defining a threshold value of available capacity for the journal pool;
- taking a first snapshot by a controller in the storage system, said snapshot being a copy of a data volume, said data volume being configured to receive data by way of write requests issued from a host computer;
- checking available capacity of the journal pool by the controller when a write request is received;
- storing a journal ~~entry~~ entries in the journal pool if the available capacity of the journal pool is not below the threshold value, wherein said threshold value is an indication of the lowest amount of available capacity of the journal pool to allow the storage system to fall below;
- stopping the storing of the journal entries by the controller if the available capacity of the journal pool is less than the threshold value to avoid the journal pool overflow;
- switching to bitmap management by the controller upon the stopping the storing of the journal entries, wherein the bitmap management tracks changes to the data in the data volume using a bitmap that represents storage areas in the data volume to keep track of the storage areas in the data volume to which new write operations are directed until additional capacity is provided for the journal pool;
- adding capacity to the journal pool by adding disks to the storage system;

Art Unit: 2161

- taking a logical snapshot and making a new journal entry for the logical snapshot;
- returning operation of the controller to ~~storing~~ store subsequent journal entries in the journal pool so long as the available capacity of the journal pool is not less than the threshold value.

36. (Currently Amended) A backup and recovery method according to claim ~~35~~ 34, wherein said

threshold value is an indication of the a lowest percentage measure of the amount of available capacity to the a total amount of capacity of the journal pool ~~that is allowable~~.

Allowable Subject Matter

6. Claims 12, 13, 15, 16, 18, 24, 25, 27, 28, 30-34, and 36 are allowed.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brent S. Stace whose telephone number is 571-272-8372 and fax number is 571-273-8372. The examiner can normally be reached on M-F 9am-5:30pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jeffrey A. Gaffin can be reached on 571-272-4146. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Brent Stace

Camy Tuong
Primary Examiner
Cam y Tuong